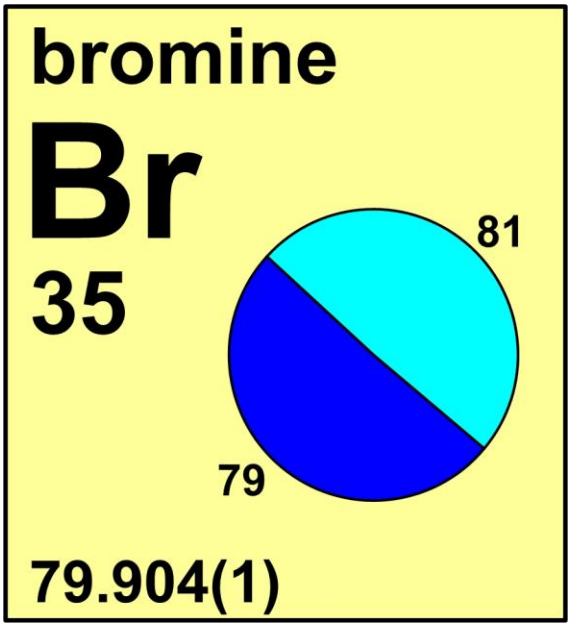
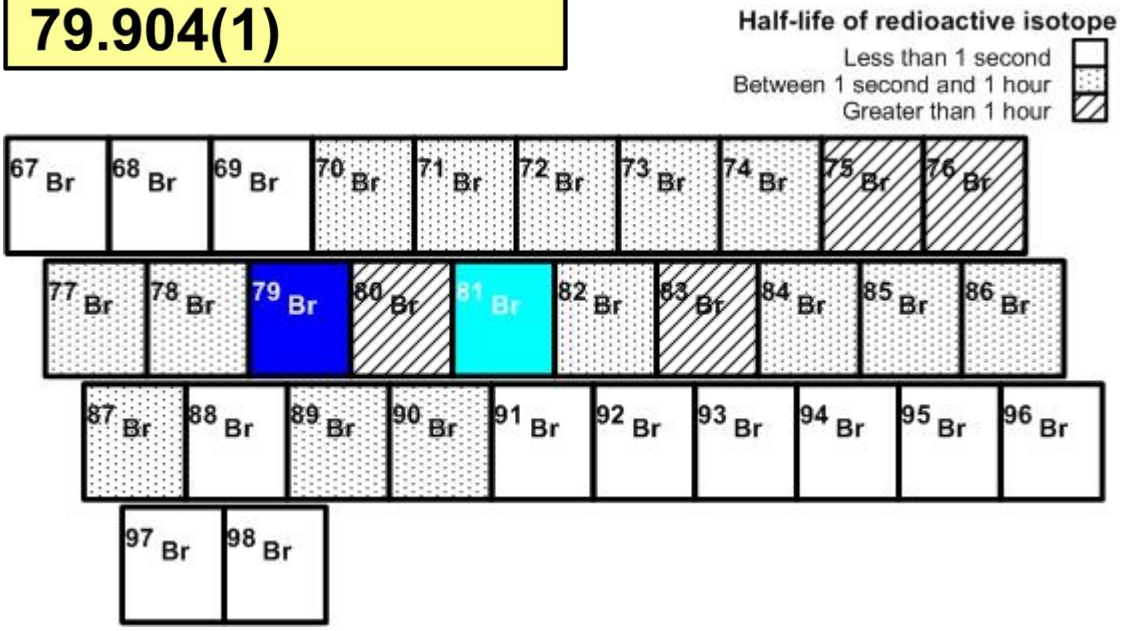
bromine



Stable isotope	Atomic mass*	Mole fraction
^{79}Br	78.918 3371	0.5069
^{81}Br	80.916 2906	0.4931

* Atomic mass given in unified atomic mass units, u.



Important applications of stable and/or radioactive isotopes

Isotopes in medicine

1) ^{79}Br is used in proton cyclotron to produce ^{77}Kr which decays to carrier-free ^{77}Br.
2) ^{77}Br is used to label radiopharmaceuticals that bind to estrogen receptors for tumor imaging. ^{75}Br is being studied for this use with PET imaging.

Isotopes in tracer studies

1) ^{79}Br can be used as a groundwater tracer. The solute size of ^{79}Br is similar to that of other halides making it an ideal tracer. Introducing large levels of ^{79}Br to groundwater and measuring the change in the natural isotope ratio of $^{79}Br/^{81}Br$ over time can be used to monitor tracer breakthrough and can be used to calculate halide travel time.
2) ^{79}Br and ^{81}Br compounds, such as ammonium bromide, bromine gas (Br_2), calcium bromide and hydrogen bromide, are currently used in life science, environmental and ecology studies as tracers.

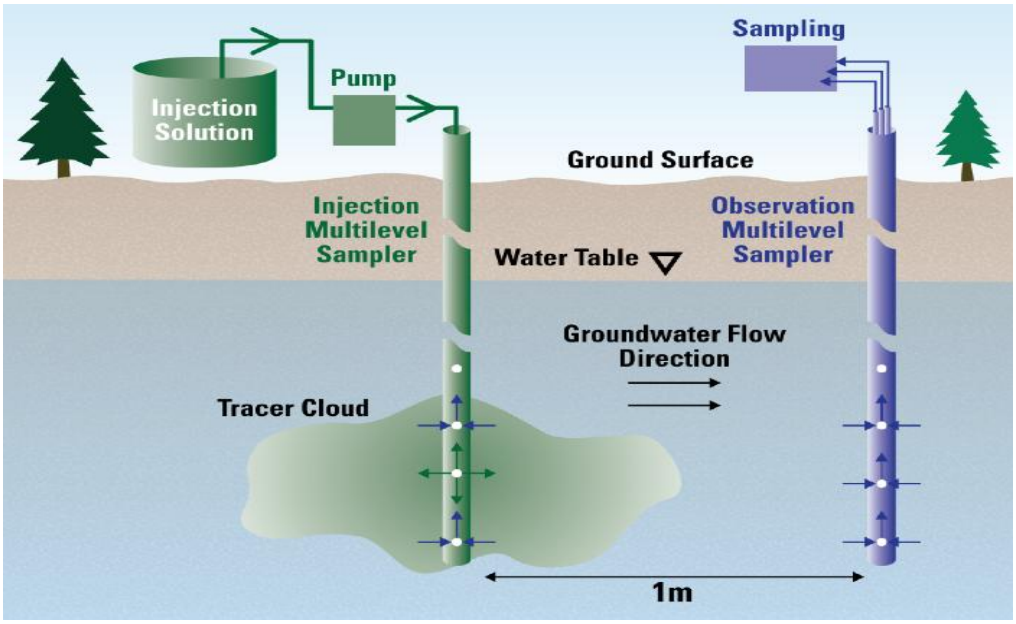


Figure 1: This is a depiction of how a subsurface/groundwater tracer test is set up. The tracer cloud is where the bromide solution would be. Samples of water in the tracer cloud would be compared to groundwater samples in the neighboring sample site for the experiment being conducted.

Isotopes in nuclear research

1) ^{82}Br is used in neutron activation analysis (NAA) which is an analytical technique that uses radioactive isotopes to perform both qualitative and quantitative multi-element analysis of a sample. NAA is based on nuclear reactions where the elemental content is determined by irradiating the subject sample with neutrons, thus creating radioactive forms of the desired element in the sample. As the sample becomes radioactive, radioisotopes are formed and decay. The decaying process emits gamma rays unique in half-life and energy and these distinct energy-signatures provide positive identification of the targeted element(s) present in the sample and can be quantified by measuring the intensity.

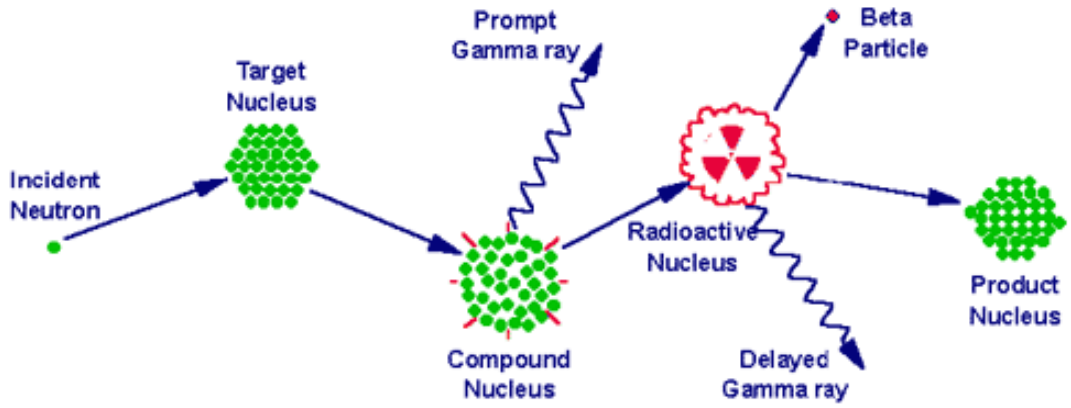


Figure 2: Diagram illustrating nuclear reaction used for NAA.